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Comparison of different anesthetic techniques used for geriatric patients who underwent TUR-P operation: A single-center experience

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Abstract
Aim: In this study, we aimed to investigate impacts that affect intensive care unit admission, mortality, and cost according to demographic and clinical parameters of patients, and different anesthetic techniques performed in patients who underwent TUR-P operation.
Material and Methods: The data of 234 patients aged 60 years and older who underwent TUR-P operations were evaluated retrospectively. The patients were examined in two groups as neuraxial and general anesthesia groups. The Charlson Comorbidity Index, preoperative laboratory parameters, the presence of comorbidity, preoperative intensive care requirement, operation duration were obtained from hospital records. The cost calculation was based on the length of the patient's stay in the hospital and intensive care unit.
Results: According to the ASA score, no significant difference was observed between operation duration, length of hospital stay and intensive care unit stay. According to the CCI score, there was no significant difference in the operation time; however, when the patient's CCI was 3 and above 3, the duration of intensive care stay and hospital stay were significantly longer. The cost increased significantly when CCI was 3 and above 3, but did not change according to the ASA score.
Discussion: In our study, it was observed that the type of anesthesia did not affect the duration of surgery, the rate of entrance to the intensive care unit, the length of stay in the intensive care, length of hospital stay, mortality and the cost. However, it was observed that the duration of hospitalization and the rate of admission to the intensive care unit increased in patients with CCI 3 and above, therefore the cost was increased.

Keywords
Anesthetic techniques; ASA; Charlson Comorbidity Index; Cost; TUR-P

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Introduction

Along with the aging population, the number of older people with urinary system diseases is also increasing. Benign prostatic hypertrophy (BPH) can cause progressive and chronic lower urinary tract symptoms in older men [1.2]. The incidence of BPH is approximately 50% in men aged 50-60 [3]. In patients with BPH, voiding and storage symptoms can be often observed, and these symptoms can have adverse effects on quality of life [4]. Transurethral prostate resection (TUR-P) operations used for the treatment of BPH, contribute to the improvement of moderate to severe symptoms significantly [5,6].

The annual cost of BPH treatment in the United States in 2006 was estimated at $ 4 billion. In Europe, it causes a significant economic burden with a treatment cost of 858 Euros per patient. Due to the demographic shift towards the elderly population, the cost of treating lower urinary tract symptoms associated with BPH is predicted to increase substantially [7,8]. Transurethral prostate resection may be associated with serious morbidity and even mortality [9]. Therefore, the most appropriate anesthetic technique should be selected for each patient individually. Considering the benefits and risks of these methods, various preoperative indices have been developed. The most commonly used indexes are the Charlson Comorbidity Index (CCI), the age-adjusted CCI, and the American Society of Anesthesiologists Physical Status Classification (ASA). These indexes reveal the risk of mortality in the preoperative evaluation of the patient [10].

In our study, we aimed to show the impacts that effect an entrance to intensive care units, mortality, and cost; according to demographical and clinical parameters of patients, and different anesthetic techniques performed on patients who underwent TUR-P operation.

Material and Methods

The study was carried out according to the Helsinki Declaration (October 2013) after obtaining the approval of the Local Clinical Research Ethics Committee (No:2018/41, date: 26.01.2018). The data of patients who underwent TUR-P operations between 04.01.2012- 15.12.2017 in our clinic were evaluated. Records of 311 patients aged 60 years and older, who underwent neuraxial anesthesia (NA) and general anesthesia (GA) were analyzed retrospectively, from the intensive care unit files and the hospital administration management system.

Patients with insufficient records, patients who were under 60 years of age, who underwent combined general and neuraxial anesthesia patients who were followed up in the intensive care unit in the preoperative period, and who were evaluated as ASA IV-V were excluded from the study. Retrospectively, 234 cases that met the study criteria were evaluated within the scope of the study. Spinal and epidural anesthesia were handled together under the head of neuraxial anesthesia. Patients' demographic data, history of smoking, American Society of Anesthesiologists (ASA) score were examined in two groups: NA and GA groups. The Charlson Comorbidity Index (CCI), preoperative laboratory parameters, the presence of comorbidity, preoperative intensive care requirement, operation times were obtained from hospital records. The length of stay in the intensive care unit, length of hospital stay, mortality rates, and cost estimates were noted. The CCI score was calculated based on the preoperative information in the hospital information management system (Table 1). The cost was calculated at the average dollar (USD) rate at the time of the patient's hospitalization. The cost calculation was based on the length of the patient's stay in the hospital and intensive care unit. GA is preferred in cases where NA is contraindicated, such as patients' refusal, receiving anticoagulant therapy, coagulopathies, and skin infection at the injection site.

Statistical Analysis

Descriptive properties of the data obtained are presented as mean and standard deviation for quantitative variables, and as frequency and percentage distribution for qualitative variables. While chi-square analysis was used for comparisons of mortality status and intensive care follow-up rate according to the type of anesthesia; One-Way Analysis of Variance was used to compare cost, length of hospital stay, and intensive care unit according to the type of anesthesia. According to the ASA score and CCI, independent samples t-test was used for comparison of hospital stay, duration of surgery, duration of intensive care unit stay. The analyzes were carried out with the help of SPSS for Windows program.

Results

It was determined that 83 (35.4%) of 234 patients who met the study criteria underwent GA, and 151 (64.5%) patients underwent NA. According to age (P = 0.28), history of smoking (P = 0.731), body mass index (BMI) (P = 0.672), ASA (P = 0.36) and CCI (P = 0.586) parameters, there was no statistically significant difference between the GA and NA groups. Demographic data of the patients are demonstrated in Table 2.

There was no statistically significant difference between the two groups according to the type of anesthesia in the following parameters: the duration of surgery (P = 0.14), the number of patients who were followed up in the intensive care unit (P = 0.879), length of stay in the intensive care unit (P = 0.914), length of hospital stay (P = 0.08), mortality (p = 0.759), and cost (P = 0.685) (Table 2).

According to the ASA score, no significant difference was observed between operation time (p = 0.153), hospital stay (P = 0.217) and intensive care unit stay (P =0.313). According to the CCI score, there was no significant difference in the operation time; however, when the patient's CCI was 3 and above 3, the duration of intensive care stay (P = 0.001) and hospital stay (P = 0.06) was significantly longer (Table 3).

In 34 (40.9%) of 83 patients who received GA, intensive care unit hospitalization was envisaged, but 2 (5.8%) patients were admitted to intensive care unit; Hospitalization in the intensive care unit was envisaged for 44 (29.1%) of 151 patients who received NA, but a total of 3 patients (6.8%) were hospitalized in the intensive care unit. There was no statistically significant difference between the type of anesthesia, and the rate of hospitalizations in the intensive care unit (p= 0.879). Cost increased significantly when CCI was 3 and above 3 (p= 0.872), but did not change according to the ASA score (p = 0.001). At CCI below 3, the cost was 461.3 ± 173.1 dollars; with a CCI above 3, the cost was calculated as 1033.7 ± 1225.3 dollars (p = 0.001).

Table 1. Charlson Comorbidity Index

Comorbidity	Weighted Score*
Myocardial infarction; congestive heart failure; peripheral vascular disease; demancia; chronic pulmonary disease; connective tissue disorder; ulcer; low grade liver disease; diabetes mellitus	1
Hemiplegia; moderate/severe renal disease; diabetes (targeted organ damage is present); neoplasm; leukemia/lymphoma	2
Moderate or severe liver disease	3
Metastatic solid tumor; AIDS	6

* The total score is obtained by adding each comorbid situation to each other. One score is added for every decade over the age of forty (like 50-59: 1 score, 60-69: 2 score).

Table 2. Distribution of demographic data according to type of anesthesia

	Group NA	Group GA	p
Number	151	83	
Age (Year)	70.3±6.9	71.6±7.3	0.280
Body Mass Index	26.7±2.8	27.1±2.9	0.672
Smoking history (n,%)	67 (%44.4)	33 (%39)	0.781
ASA, n (%)			
I	2 (%1.3)	0 (%0)	
II	57 (%37.7)	23 (%27)	0.360
III	92 (%60.9)	60 (%72)	
CCI, n, (%)			
<3	139 (%92)	78 (%93)	0.586
>3	12 (%7.9)	5 (%6)	

ASA: American Society of Anesthesiology score
CCI: Charlson Comorbidity Index

Table 3. Distribution of the studied parameters according to type of anesthesia

	Group NA	Group GA	p
Duration of operation, minute, mean ± SD	81.9± 40.3	82.1±50.8	0.104
Number of ICU stay, n ,%	3 (%1.9)	2 (%2.4)	0.879
Duration of ICU (day) mean±SD	0.07±0.49	0.05±0.32	0.914
Duration of hospitalization (day) mean±SD	4.5±2.49	5.3±3.4	0.080
Mortality, n, %	1 (%0.6)	0 (%0)	0.759
Cost (USD) mean±SD	490.8±312.9	532.6±524.2	0.685

Discussion

The aging population results in an increased number of surgical procedures in elderly patients. Several risk factors for morbidity and mortality after surgery increase with aging. However, increasing age itself is an important risk factor for postoperative morbidity and mortality [11]. The most important factor affecting perioperative morbidity and mortality in elderly patients is concomitant diseases originating from organs and systems, especially cardiovascular, pulmonary, endocrine, and neurological systems [12.13].

More than 75% of TUR-P operations are performed under regional anesthesia. Spinal anesthesia is generally accepted as the technique of choice [14]. Regional anesthesia provides early detection of complications such as TUR-P syndrome and bladder perforation. It also potentially reduces blood loss, provides analgesia in the early postoperative period, and reduces the incidence of deep venous thrombosis. Increased blood flow due to sympathetic blockade can help reduce thrombosis and prevent mental or cognitive dysfunction in elderly patients [14]. However GA is performed in cases such as the patient's refusal to accept spinal anesthesia, coagulopathy, taking anticoagulant therapy, infection at the injection site or aortic stenosis.

Kaufman et al. [15] reported that intraoperative NA administration could reduce the need for an intensive care unit after orthopedic surgery, especially in high-risk patients (GA; n=38 and NA; n=45) In addition, it has been shown that NA could reduce the need for postoperative mechanical ventilation even in high-risk patients such as the elderly and myasthenia graves [16]. In our study, the need for preoperative intensive care was seen in a large number of patients, since the elderly patients with comorbidities were examined. However, due to the fact that the duration of surgery was short and the form of anesthesia was mostly NA, the intensive care unit need was low. Although different anesthesia methods were performed, there was no statistically significant relationship between the cases for the intensive care requirement.

ASA and CCI are commonly used as preoperative evaluation scales. In these evaluations, each methodology was found to be related to the rate of operative complications [17]. In a prospective study by Valerio et al. [18] ASA grade was noted as an important and independent predictor of early morbidity after transurethral procedures. The use of ASA can assist clinicians in the decision-making process to determine the benefit and harm of the procedure for the patient. In a recent analysis by Mandal et al. [17] 722 patients who underwent TUR-P showed that men with higher CCI scores had a higher morbidity rate than men with low scores; and that CCI was a fast, simple and reproducible score. It was emphasized that it was a system that could accurately predict operative complications after TUR-P.

Guo et al.[19] found that surgical complications in male patients with CCI 0, 1, and ≥2 were 10.6%, 10.0%, and 13.1%, respectively. The authors reported that although there was no significant difference in patients with ASA≥3 or CCI≥2, the rate of operative complications tended to be higher than in those with low scores (p= 0.183 and p= 0.593, respectively). Therefore, they reported that they could not predict higher complications in patients with higher ASA grades or CCI scores. In our study, length of hospital stay and intensive care unit stay were statistically analyzed according to ASA, and no significant difference was observed. However, when the patient's CCI score was 3 and above 3, it was seen that the length of stay in the intensive care unit (ICU) and hospital were statistically significantly longer (P = 0.001).

Treatment of BPH in the geriatric population creates an economic burden. Since BPH is a disease seen in older ages, it increases factors affecting the treatment costs of these patients. We did not find any study calculating the cost of TUR-P operations according to the type of anesthesia in geriatric patients. In our study, the reasons that increase the cost of TUR-P surgeries were investigated. Retrospectively, the relationship between costs and preoperative values of patients, comorbidity indices, duration of surgery, forms of anesthesia, and duration of intensive care unit stay were examined. Accordingly, the number of additional diseases in the patient

was three and over three, and the CCI index 3 and above 3 significantly increased the cost. In our study, since there were only 5 patients who went to the intensive care unit, a significant relationship could not be established between the duration of intensive care unit and the cost. However, the cost of patients staying in intensive care unit was found to be higher. Although costs of anesthesia change hospital costs, the propotion of anesthesia cost is small because intraoperative anesthesia costs are less than 6% of total hospital costs [20]. The study provided evidence that the probability of reducing total hospital costs is low, depending on different anesthetic techniques [21]. In our study, no significant difference was found between the technique of anesthesia and its cost (p = 0.685).

This study has certain limitations. Our study was retrospective in nature, and because of this, we could not perform randomization. Our results should be supported by prospective, and randomized trials.

Conclusion

In our study, in which we aimed to evaluate the choice of anesthesia method to reduce the need for intensive care, mortality and cost in patients undergoing TUR-P due to the increase in the geriatric population. It was observed that the type of anesthesia did not affect the duration of surgery, the rate of entrance to intensive care unit, the length of stay in the intensive care unit, length of hospital stay, mortality and cost. However, it was observed that the duration of hospitalization and intensive care unit entrance increased in patients with CCI 3 and above, therefore the cost increased. It was concluded that ASA scoring was not as significant as CCI for predicting the rate of ICU entrance and length of hospitalization.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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